Foresight Guiding Research and Innovation at global level

Section F2.2.
of the report on

The state of foresight in food and agriculture and the roads toward improvement

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Chapter F2. Foresight Guiding Research and Innovation

The GCARD2 F2 session on "Foresight Guiding Research and Innovation" has two sessions running in parallel. Session F2.1 is dedicated to the regional and sub-regional levels. Relevant material from the inventory (the aggregate report "The State of Foresight in Food and Agriculture and the Roads Toward Improvement" and reference documents on recent foresight works and related Briefs) has been shared with each regional forum to facilitate their own synthesis on foresight in their respective regions. Regional reports form the content of the Section F2.1 of this document and will be available in separate documents. Session F2.2 is focusing on foresight at the global level. Section F.2.2 below provides information that is relevant for the discussions during the session; based on the analysis of the global foresight works as mentioned in the inventory.

F2.1. At regional/national level

(As a reminder, please note that each regional forum contributes to this section for their own region in a separate document).

F2.2. At global level

At GCARD1 (2010) in a parallel session authors of 10 long-term outlook works related to the future of agriculture and food discussed with a broader audience the main points they had synthesized from previous exchanges they had together. They highlighted in particular, several points of convergence as follows:

- Future evolution of global food availability in 2050 is not so much a production problem but a local food access problem, which turns food security attention to the needs of the poor, urban and rural, and particularly of poor farmers;
- Understanding the situation of poor rural people, particularly farmers and their perspectives for the future remains a huge challenge;
- Ecosystem degradation and climate change impacts will put more pressure on poor farmers;
- A range of scientific approaches, paradigms, concepts and methodologies must be maintained in order to develop research on more and more complex issues.[1]

They also identified areas requiring further discussions; such as those related in particular with the implicit models of farming in the future (family farming, pluri-activity, agro-business, new entrepreneurship farms) these works carried, or the meaning of "scale", or the meaning of food sovereignty, food security and self-sufficiency in different contexts and political goals.

The orientations for improved foresight that can be found in the GCARD Roadmap resulted from these debates. The Roadmap calls for "...*forward-looking, anticipatory research and analysis integrating a range of perspectives on key issues, making use of the best available data and interpretations from different sources and directly integrating the diverse views of farmers and other stakeholders on specific problems, so that important issues are examined through multiple 'lenses'*" is a great challenge for foresight at the global level.

[1] Hubert B. *et al*. (2010). Forward thinking in Agriculture and Food. A platform for a dialogue to be continued. *Perspectives-research*, Cirad n°6, Sept 2010, CIRAD, Montpellier.
http://www.cirad.fr/content/download/4595/42828/version/2/file/Perspective06.pdf

Since the GCARD 1, we have been successful in putting together the needed diversity of stakeholders and approaches and in understanding better the multidimensional and complex issues requiring a plurality of views and visions. To what extent and how does global works help decision-makers, orienting research, innovation and policies? Have stakeholders been sufficiently informed on alternative futures scenarios? Have they debated the desirability, consequences, winners and losers of diverse scenarios? How can we develop collective actions in foresight that are more focused on the need of the poor, especially poor farmers, looking at longer-term drivers?

This section of the report offers a synthesis and some elements of reflection to these questions. It draws from the detailed analysis of 14 recent foresight studies and interactions with some of their authors or people involved in these. From these 14 works we have been able to facilitate the production of 11 four-page Briefs highlighting the key messages these works carried, including whenever possible impact and lessons learned.[2] For the remaining three studies we interacted with their authors in order to collect information to be used for this analysis (see Annex 1).[3]

Some of the results presented here are similar to those presented in the aggregated report. However, they are now more specific to global foresight and they are intended to help thinking about what we can do and how in order to address the questions mentioned above.

To start with, we present some key features about these foresight works. We then focus on challenges, impacts and implications for future global foresight works as a source of information for further discussion and particularly commitments at the GCARD.

The state of global foresight in agriculture

Table 1 provides some quantitative data on the key features of these global foresight works. It shows that global foresight works aim above all at producing knowledge and then at policy development and priority setting. International organisations are the most important sources of global foresight work. Other sectors are less represented (national research organisation, governments, NGOs). We observe that no civil society organisation (excluding NGO), no farmer organisation has initiated any global foresight work in agriculture and rural development over the recent years.

Only European and North American institutions have conducted global foresight studies. Africa, Asia and Latin America are absent. However, some studies conducted by European organisations entail components or have direct foresight applications for specific regions, in majority Europe. Few of them (see for example Brief n° 16, 21, 38, 40, and 42) have developed specific content relevant to either one or several other regions (Africa, Asia or Latin America).

[2] Some of these are too recent for a comprehensive analysis of impact or lessons learned. Yet, authors have endeavored to provide as much as possible their insights, supported by evidence on lessons and impact. We are greatly thankful to them for their cooperation.

[3] We identified 14 global foresight studies recently conducted. It is likely that more original global foresight works existed. We do not claim to present an exhaustive update. However, this is so far the most comprehensive one. We are reasonably confident that the resulting analysis is an honest expression of what is going on worldwide in this field.

Title	Purpose				Request by							Method			Years	Cost					Inclusion			
	KP	CN	PPI	CD	GO	NSI	RO	IO	NGC	CSO	N	PS	QT	MX	QL		< 100	100-500	500-1000	1000-2000	2000<	< 50	51-200	201-500	> 500
Sustainable Food Consumption in a resource-constrained world	X							X							X	0.5		X				X			
A Table for Seven Billion		X	X					X							X	1	X					X			
Biofuels and Agricultural markets: implications for food security	X							X					X			0.25		X				X			
Towards sustainable world food systems: drivers, key issues ans research needs	X		X				X								X	1.5			X				X		
Does less meat mean cheaper food for others?	X							X					X			0.25		X				X			
Exploring futures of food and farming systems: the Agrimonde scenarios	X		X				X							X		3			X			X			
World food supply in a context of increasingly competing claims	X		X					X						X		3				X		X			
Debunking the water scarcity myth: understanding future water use challenges	X							X						X		0.6		X				X			
Whay are the likely developments in world agriculture towards 2050?			X					X						X		3			X			X			
What challenges is agriculture facing? Five Scenarios for 2050			X				X							X		0.5		X				X			
The Future of Food and Farming	X		X				X							X		2				X					X
Development and Climate Change	X							X					X			1		X				X			
Global bioenergy potentials from agricultural land in 2050	X							X					X			1		X				X			
Food Security, Farming, and Climate Change to 2050	X	X		X				X					X			3.3				X			X		

Table 1. Some key features of global foresight works

Note: In yellow, cases supported by Briefs;
In white, cases based on information provided by authors.

Source: GFAR inventory

KP: Knowledge production
CN: Cooperation and Networking
PPI: Policy and Priorities for Innovation
CD: Capacity Development

The diversity of approaches used in the global foresight works shows an almost equal distribution of quantitative, mixed and qualitative methods. Global foresight works last in average 1.5 years but range from a few months to more than three years. The cost is rather limited with most of the works under the US$500 000 threshold (estimates taking into account the cost of manpower). Global foresight works with the exception of the UK foresight study (Brief n°42) include usually less than 50 people, most of them being scientists. Other stakeholders are rarely directly engaged in the works but are more frequently consulted at the end of the process as users or providers of feedback about the results.

The principal and recurrent lessons learnt from the processes through which these foresight works developed support the idea of opening foresight, as stated in the GCARD Roadmap. These lessons are:

1. the benefit of linking different disciplines in an interdisciplinary way, not as a collection of discipline skills;
2. the benefit (and call for) combining quantitative modeling with qualitative scenarios;
3. the benefit of involving broad stakeholders groups, widening the scope of the studies.

However, this opening has also risks such as the lack of institutional and academic recognition of the value of interdisciplinary approaches, reluctance of specialised scientists to go beyond their field of competence, the possibility of polarized debates among stakeholders, the paradox of stakeholder involvement for frame-breaking thinking (people concerns with their immediate own interest can hardly think out of the box).

Some challenges toward improved global foresight

- Be more institutionally open, with CSO/NGO/FO as co-operators not just end-users
- Be less "Westernized", with more global foresight studies from Africa, Asia, and Latin America
- Combine approaches and become more interdisciplinary

Focal topics of the global foresight works

The 14 foresight works show the following spread of focal topics:

- Eleven (11) with a focus on global food security and agriculture, with various entries such as biofuel, climate change, technologies, consumption patterns,
- Three (3) focusing on bio-physical factors (climate change, bioenergy and water).

Farming Patterns of the Future

Global foresight works do not often explicitly tackle the issue of the farming patterns of the future and say very little about who will be or how would be farming. It seems that implicitly, foresight works using market, prices, demography and technology variables as drivers of the future evolution have a worldview where farming will be highly specialized, high input, productivity-based activity oriented towards profit maximization. The SCAR 3 case (Brief n°1) explicitly refers to two opposite worldviews: productivity vs. sufficiency, whose implications do not only shape research priorities and orientations but also future farming systems. In the productivity case, farms practice sustainable intensification (technologies to produce more and reduce negative impacts on the environment); in the

sufficiency case farms balance the various dimensions of sustainability from the outset. The Agrimonde (Brief n°16) case also further emphasizes this as a potential rupture in its two scenarios. It contrasts diversity based on ecological intensification with productivity. The PBL Study (Brief n°17) indicates that on average, farms will be more productive and market-oriented. Sustainable intensification can take different forms ranging from technologically-oriented capital-intensive systems to ecologically-oriented system producing environmental services. Yet, with the exception of Oxfam (Brief n°2), these works do not develop what kind of farms would be bearing these evolutions. The Oxfam case indicates that diverse farming patterns could/should co-exist rather than opposing for example low input (small scale) versus high (input) large-scale input agriculture.

As a result, while most of the works further reinforce the GCARD1 statement that there will be enough food to feed the world, at least two controversial/unexplored domains deserve further attention from a foresight viewpoint:

- What are the alternative ways for ensuring that globally food and nutrition security, poverty reduction, and sustainable management of natural resources? Can they combine? Should they combine? A particular focus and clarification are needed as regards the current worldviews about the opposition between productivity-based and sufficiency-based including sustainable intensification, ecological intensification, agro-ecological production, ecosystem services.

- What are the options about who will farm the future and what are their implications? Are "farmers of the future" scenarios reducible to two alternatives, i.e. large high input commercial farms providing the bulk of the food at the cost of our environment or are smaller multi-functional low input farms producing ecosystem services able to feed the world? Can these models co-exist? Under what conditions? Are there other models we have not been able to consider yet?

In order to address these issues, global works will need to link with more local works at regional, national or even sub-national levels. This will not be possible without commitment at these different scales to develop a more comprehensive and collective approach.

Future land use changes

Agricultural expansion is seen as likely to take place and mostly in the developing world, particularly in Africa, until 2030. Cultivated areas would stabilize or shrink in developed countries. Agrimonde scenarios indicate that there is sufficient land available for agriculture to feed nine billion people in 2050 even when preserving forests, and even with a less intensifying scenario, provided some changes in our consumption patterns are undertaken. However, this would not happen without robust land planning polices, the PBL works indicates. In addition, the evolution of consumption patterns, urbanization and the demand for bioenergy will bring major uncertainties about future land uses changes.

Global foresight work identify some common global drivers (and also uncertainties) of future land use changes. These are:

- Urbanization understood as the patterns of population migration from rural to urban areas, essentially conditioned by the services offered in urban areas that people cannot access in rural areas;
- Changes in consumption pattern, especially meat consumption, dairy products and cereals, with contrasted patterns between regions, especially developed and developing countries;
- Prices of commodities and other products that can be competing for the same land;
- Demand for non-food products which could be produced on agricultural land, such as bioenergy, forest products, mining products, environmental services.

Controversies requiring further scrutiny of foresight are identical to those identified when analyzing all foresight works (see Chapter F1). At the global level, these could be dealt with by looking at what conditions the evolution of these uncertainties, rather than trying to estimate from current trends what will be the most likely scenario. Questions that need to be addressed are:

- What are the new drivers of changes in land area uses for agriculture? What would make agricultural land expand or shrink?
- What would drive how land will be used? Can multifunctional use coexist with specialized use? Are there other evolutions we have not considered yet?
- What would drive the desertion or revitalization of rural areas?

It must be pointed out that global foresight work alone cannot really address the complexity of these controversies. Some of the cases call for complementary work of going up to the local level in order to take into account drivers that are context-specific and contingent to countries' local institutions and factors such as land tenure, culture, demography and policies.

Linking future production and consumption

Most global works concur that the evolution of consumption will be driving the evolution of production. They consider that dietary patterns are key determinants of production patterns. How consumers modify their diet in the long-term is a key issue. This includes changes related to food quality (certification) and diversity, switching from home-prepared food to food prepared outside, concerns for integrated production systems (fair trade), animal welfare, or environmental sustainability (waste management, agro-ecological production). Urban consumers in developing countries will be carrying much more weight than today. However consumption scenarios and exploration of future consumption patterns are not very much developed. Agrimonde includes one trend and one rupture consumption scenario. FAO (Brief n°38) has made one projection hypothesis, although it states that convergence is not inevitable due to cultural reasons, for example, and their projections about the required amount of food needed in 2050 varies regularly. The Dualine case (Brief n°13) indicates also that with more and more constraints added to the functioning of food systems (linking consumption and production) it may be needed to completely re-think these? This opens a large field for research including foresight.

The development and strategy of firms (food industry as well as retail) is also a key driver. These include integration, spread of supermarkets with cold chains which can boost local production. Policies targeting consumers may have a substantial role through their potential to influence food consumption habits. Waste management emerges as an area where policies can influence both production and consumption sides.

A central question needs to be tackled through more foresight work on the future evolution of consumption patterns and how it will affect production:

> What are/could be the drivers of food consumption/dietary patterns and how could they evolve? Are there other options outside of convergence toward a common standard supplied by international markets or local and diversified consumption patterns prevailing, supplied by local/proximity production systems?

New challenges

Most of the global foresight works focus on the future of food and agriculture with a strong emphasis on food security and the question of feeding nine billion people in 2050. The new challenges they highlight are thus primarily related to food security. A remarkable shift is happening; from looking at the production side to looking at the consumption side. Food security is lesser seen as a food production issue than a food consumption issue. ***Dietary or consumption patterns are now emerging as a driving force*** whose evolution will shape the future states of food and nutrition security. This calls for more work on the drivers of this driving force such as investigating the roots of consumers 'behaviour, understanding the role of the agro-industry and food retail chains, exploring the capacity of policies to influence consumption patterns. Global foresight needs also to be disaggregated in order to take into consideration regional/local specificities. In terms of method, this requires to ***re-think how global foresight works approach complex multi-scale interactions***. Global foresight works with a regional dimension currently developed from world level approaches which are then scaled down to specific regions (Brief n° 40, Brief n°1 and Brief n°17). A complementary process linking up local/regional foresight into a more global picture is also needed.

Yet, global foresight works do not discard the production side of food security. We can identify two currently emerging challenges. The first one relates to a shift from anticipating future yields and productivity gap, to that of ***identifying the driving forces which shape yields and productivity***. Water, land and energy are getting the attention. The novel area of focus is about the evolutions of water use, land use and energy use. A step forward into understanding complexity is underway; projections of water, land or energy consumption is giving way to the exploration of ruptures and alternative paths in the use of these factors. The second challenge is the ***systematic exploration of alternative options to the current paradigm of productivity***, short-term profit and related "business as usual scenario". The sustainability issue comes strongly on the fore scene; sustainability of food systems, of resources use and of farming systems. There are calls from different works to make this a key question for the future, with particular attention to the diversity of productive systems.

The inclusion of socio-economic dimensions in addition to the usual technological dimensions, looking beyond agriculture, was already highlighted in the GCARD1, especially poverty issues and unequal access to food. Yet, these dimensions are still largely missing in global foresight works. The challenge is thus to improve our understanding of the drivers of food access so as to identify what kind of research is needed to improve it, and if research alone is sufficient.

These new challenges related to food security converge on a new but important question which has not been directly addressed through global foresight works so far: ***the question of the farmers of the future***.

- The current international research agenda needs to be enriched and progressively shifted to new dimensions.
- Global foresight works indicate that maximizing the volume of production per unit of factor, which is the "*business as usual*" scenario of agricultural research, cannot respond fully to the new challenges.
- Global research (including foresight) has to incorporate broader and long-term societal dimensions and their implications into the existing technological, biological and economic approaches.
- The focus should be progressively turned into research outputs that will i) optimize the use of that part of the resources consumed for food production given sustainability objectives and social choices, ii) respond to the conditions that wider dimensions beyond agricultural production will impose on different types of farmers in different places.

Impact: influence and change

The information on the impact of global foresight work has been provided by the authors of the Briefs or informants upon our request for the purpose of the inventory. In the majority of cases, there is no evaluation system in place enabling us to report more "objectively" about the impact these works have had.

The analysis of the diffusion of global foresight works shows that these are highly visible on the international scenes. Their visibility is higher than that of regional or national works and they are more frequently referred to in the international community of agricultural research for development, donor agencies and by policy makers. What contributes to their visibility is primarily the fact that most of them are produced by international or regional organizations widely known themselves (FAO, IFPRI, European Commission) or advanced national research organization, equally well-known (the UK Foresight group, CIRAD/INRA in France, PBL in the Netherlands, SLU in Sweden, etc.) Many of these works have been published in official reports by the institutions hosting the foresight study.

Global foresight works are also known to the academic world through the participation of their authors in scientific events and through their publications. All foresight works have produced at least a public report or a book (see Table 2). As indicated in many Briefs, the fact that the studies yielded challenging results contributed to their visibility, their authors being invited to present in various fora, including non academic ones, in presence of stakeholders.

		Category of impact						Diffusion			Evaluation
		Influence			Change						
		RA/FD	LS	DM	TIP	TEP	OC	*Public Reports*	*Articles/Book*	*Conferences*	*Yes/No*
Brief 01	Sustainable Food Consumption in a resource-constrained world				X			X			*no*
Brief 03	A Table for Seven Billion	X			X	X		X			*no*
Brief 09	Biofuels and Agricultural markets: implications for food security	X		X					X	X	*no*
Brief 15	Does less meat mean cheaper food for others?	X							X	X	*no*
Brief 10	Exploring futures of food and farming systems: the Agrimonde scenarios	X			X				X	X	*no*
Brief 13	Towards sustainable world food systems: drivers, key issues ans research needs				X						*no*
Brief 17	World food supply in a context of increasingly competing claims			X	X	X			X	X	*no*
Brief 21	Debunking the water scarcity myth: understanding future water use challenges	X									*no*
Brief 38	What are the likely developments in world agriculture towards 2050?	X				X		X			*no*
Brief 40	What challenges is agriculture facing? Five Scenarios for 2050	X	X		X	X		X	X		*yes*
No Brief	The Future of Food and Farming	X	X		X	X		X		X	*yes*
No Brief	Development and Climate Change	X						X			*no*
No Brief	Global bioenergy potentials from agricultural land in 2050	X						X			*no*
No Brief	Food Security, Farming, and Climate Change to 2050				X				X		*no*
TOTAL		**10**	**2**	**2**	**8**	**5**	**0**	**7**	**6**	**5**	

Table 2. Impact and diffusion of global foresight works
Source: GFAR inventory

RA/FD: raising awareness and fostering debates at a large scale
LS: linking stakeholders
DM: contributing to development of methods internally and externally
TIP: directly transforming internal policies/priorities/orientations
TEP: directly transforming external policies/priorities/orientations
OC: directly provoking organizational/functional changes

Influence or change?

In the vast majority of cases, the authors of these foresight studies report a first impact through the influence on awareness and capacity to foster debates. Nine of the 14 cases indicate they had visible influence on international debates and provide some substantial information to support their statements. Beyond impact through influencing opinions and debates, many works also mention the capacity to impact policies internally (referred to as TIP in the Table), or externally (TEP). Eight of 14 cases indicate that they contributed to change in policy orientations, with these claims being supported by trusted references given by the authors. In absence of other means of verification (for example formal acknowledgement by the users of the influence of these foresight works), these references/examples form a substantial basis for gauging their impact. Authors have been able to explicitly cite which policy frameworks or orientations/priorities have incorporated the outputs of their foresight works internally (Briefs n° 2, 16, 17, 40) or externally (Briefs n° 1, 17, 38, 40).

Evaluation however remains rare with only two cases showing that an evaluation process has been undertaken. The *Future Agriculture Programme* in Sweden is currently under an evaluation by groups of scientists and stakeholders. Their conclusions will determine the decision on the next phase of the programme. The UK foresight project has established a follow-up team which conducted a "One-year review" of the impact of its report on the Future of Food and Farming. So far it is a unique systematic effort to track down and document the impact of a global foresight study. The report provides evidence of a large scale impact, especially influencing the views and the agendas across various sectors and at various scales.[4]

Towards improved global foresight at the GCARD2

In the GCARD 2 foresight session F2.2 "Foresight guiding research priorities at global level" this global state will be presented and supported by highlights from a few selected cases.
This will be followed by two presentations. The first one from the CGIAR Consortium will introduce "The Foresight dimension into the CGIAR Strategy and Results Framework Action Plan". The second one is synthesis of the ongoing work undertaken through the *Forward Thinking Platform of the Global Foresight Hub*. It is intended to show that collective action can improve our understanding of future challenges.

The discussion that will follow aims at agreements on proposing collective actions to improve the use of global foresight in making research and innovation systems more responsive to future development needs and give it a stronger focus on smallholder farmers.

Based on the elements included in the presentations preceding these discussions a number of potential actions have been identified as follows. These actions are not exhaustive, but they would all contribute to move global foresight to the directions requested by the GCARD Roadmap. Their feasibility and implementation will depend on the commitments the stakeholders will be willing to make at the GCARD2 and thereafter.

[4] http://www.bis.gov.uk/assets/foresight/docs/food-and-farming/12-831-one-year-review-global-food-and-farming-futures.pdf

The first set of actions would not require additional resources from stakeholders, but the willingness to actively engage some of their existing resources in these actions:

- Participating to the *Forward Thinking Platform* bringing together foresight practitioners from various sectors to advance thinking, tools and methods in foresight for agriculture;

- Helping the incorporation of multiple visions based on foresight as orientations for the SRF Action Plan;

- Supporting a foresight practitioners - decision makers policy dialogue arena;

- A major integrated global foresight effort on the future of farming patterns.

The second series of action would require additional resources or specific large-scale programme investment:

- Support the regular engagement of national and regional actors in global foresight processes;

- A regular foresight practitioners - decision makers policy dialogue arena;

- A collective multi-disciplinary multi-sector foresight project on the Farmers of the Future.

Annex 1. Sources for the synthesis on global foresight works

1. Material from which the Briefs have been developed

- Sustainable food consumption and production in a resource-constrained world
- Who will feed the World? The production Challenge
- Global Scenarios for Biofuels: Impact and Implications
- Pour une alimentation durable. Réflexion stratégique DuALIne
- Feeding the Future's Changing Diets
- Agrimonde: Scenarios and Challenges for Feeding the World in 2050
- EU Resource Efficiency Perspectives in a Global Context
- Water, Food and Poverty in River basins: Defining the Limits
- Looking ahead in world food and agriculture: Perspectives to 2050
- Five scenarios for 2050 - Conditions for Agriculture and Land Use
- The livestock - climate - poverty nexus

2. Links to the Briefs

- Brief No. 01: **Sustainable food consumption and production in a resource-constrained world**
- Brief No. 02: **A table for seven billion: Six billion have enough to eat – (only) one billion to go**
- Brief No. 09: **Biofuels and agricultural markets: Implications for food security**
- Brief No. 13: **Towards sustainable world food systems: drivers, key issues and research needs**
- Brief No. 15: **Does Less Meat for Some Mean Cheaper Food for Others?**
- Brief No. 16: **Exploring the limits of food and farming systems: the Agrimonde scenarios**
- Brief No. 17: **World food supply in a context of environmental change and increasingly competing claims on natural resources**
- Brief No. 21: **Debunking the water scarcity myth: understanding future water use challenges**
- Brief No. 38: **What are the likely developments in world agriculture towards 2050??**

Under preparation:

- Brief No. 40. **What challenges is agriculture facing? Five scenarios for 2050.**
- Brief No. 42. **The Future of Food and Farming**
- Brief No. 43. **The livestock - climate - poverty nexus**

3. Additional works used (no Brief developed)

- Climate change impacts on agricultural yields
- Global bioenergy potentials from agricultural land in 2050
- Food Security, Farming, and Climate Change to 2050: Scenarios, Results, Policy Options